

What is claimed is:

1. A manipulator comprising:

an operation command unit provided with an attitude adjusting unit and an end effector control unit;

a connecting unit having one end connected to the operation command unit;

a working unit connected to the other end of the connecting unit and provided with an end effector and a support unit supporting the end effector for motions in at least two degrees of freedom of motion; and

a control unit that transmits an operation command provided by the attitude adjusting unit to the support unit to adjust the attitude of the end effector and transmits an operation command provided by the end effector control unit to the end effector to operate the end effector;

wherein the support unit includes a first joint capable of turning about a first axis perpendicular to a center axis of the connecting unit, and a second joint capable of turning about a second axis perpendicular to the first axis,

the end effector has a center axis substantially parallel to the second axis,

the attitude adjusting unit includes a third joint capable of turning about a third axis perpendicular to the center axis of the connecting unit and a fourth joint capable of turning about a fourth axis perpendicular to the third axis, and

the end effector control unit is provided to be gripped by fingers extending substantially in parallel to the fourth axis.

2. The manipulator according to claim 1, wherein the working unit has two working joints mounted on the second joint, the two working joints being capable of turning about the second axis,

the two working joints are rotated in the same direction to rotate the second joint, and

the two working joints are rotated in opposite directions, respectively, to drive the end effector for gripping and releasing actions.

3. The manipulator according to claim 2, wherein two

working links are supported on the two working joints, respectively, and capable of turning about axes in directions parallel to and in directions perpendicular to the axis of the two working joints, and

the working links are rotatably joined together.

4. The manipulator according to claim 1 further comprising:

a sensor capable of measuring force acting in a direction perpendicular to the axes of the third and fourth joint and included in the operation command unit; and

an actuator combined with the connecting unit and capable of applying a torque to the connecting unit to urge the connecting unit to turn about its axis;

wherein the actuator is controlled on the basis of a value measured by the sensor.

5. The manipulator according to claim 4, wherein direction of the torque produced by the actuator is controlled on the basis of the relation between a sign of an angle indicating an angular position of the third joint and that of a value measured by the sensor.

6. The manipulator according to claim 5, wherein the torque produced by the actuator is controlled to vary in proportion to the value measured by the sensor.

7. A manipulator comprising:

a working unit provided with an end effector and a support unit supporting the end effector for motions in at least two degrees of freedom of motion;

wherein the support unit includes a first joint capable of turning about a first axis, and a second joint capable of turning about a second axis perpendicular to the first axis,

wherein the working unit has two working joints mounted on the second joint, the two working joints being capable of turning about the second axis,

the two working joints are rotated in the same direction to rotate the second joint, and

the two working joints are rotated in opposite directions, respectively, to drive the end effector for gripping and releasing

actions.

8. The manipulator according to claim 7, wherein two working links are supported on the two working joints, respectively, and capable of turning about axes in directions parallel to and in directions perpendicular to the axes of the two working joints, and

the working links are rotatably joined together.

00000000000000000000000000000000